

Cal Val Telecon
June 5, 2014

Stennis - Cal val Team

Update on VIIRS Ocean Color Cal Val USM, NRL, QNA, SDSU

- 1. Tracking the Moby and WavCis**
- 2. Sensitivity of calibration “gains”
to ocean color processing in coastal
and open waters**
- 3. Banding and striping issues**
- 4. Future Plans**
 - 4. Cruises - Gulf and East Coast**

Constraints

- Jen 2- - 4 slides
- Moby –
 - Data set
 - Step one – constraint
 - Step 2 = constraint
 - Step 3 constraint
 - Final data sets and Gains
- Wavcis SAME

STEPS TO QUALITY CONTROL FOR GAINS

1. **Accumulate coincident matchups (+- 3hrs) of satellite and in situ data (blue markers).**
2. **Apply screening criteria to coincident collections (green and yellow markers).**
3. **Calculate vLt/Lt for each matchup**
4. **Plot spectral gains and remove anomalies.**
5. **Calculate an average gain for each site: MOBY vicarious calibration and WCIS VGA.**
6. **Apply Vicarious calibration and VGA using APS and look at effects on the nLw retrievals**
7. **Effects of Vicarious Calibration and VGA on chlorophyll products**

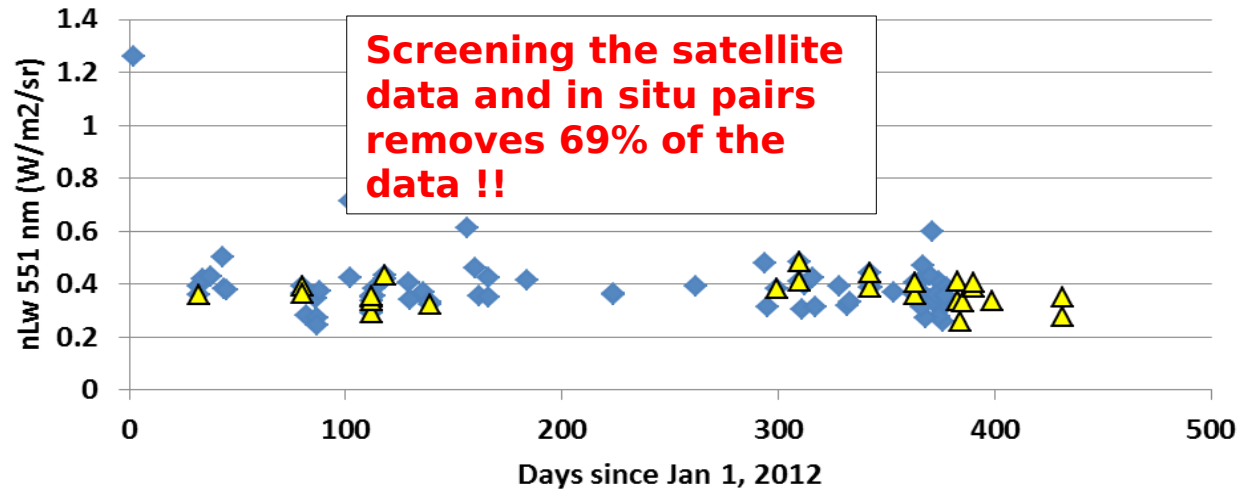
6. Conclusions:

- The procedure addresses selection criteria for optimizing data quality in a near real-time situation, allowing for vicarious calibration and regional VGA to be established for

MOBY satellite derived nLw (551 nm)

Jan 1, 2012 to April 30, 2013

◆ original sample, n = 81 ▲ passed screening criteria, n = 25



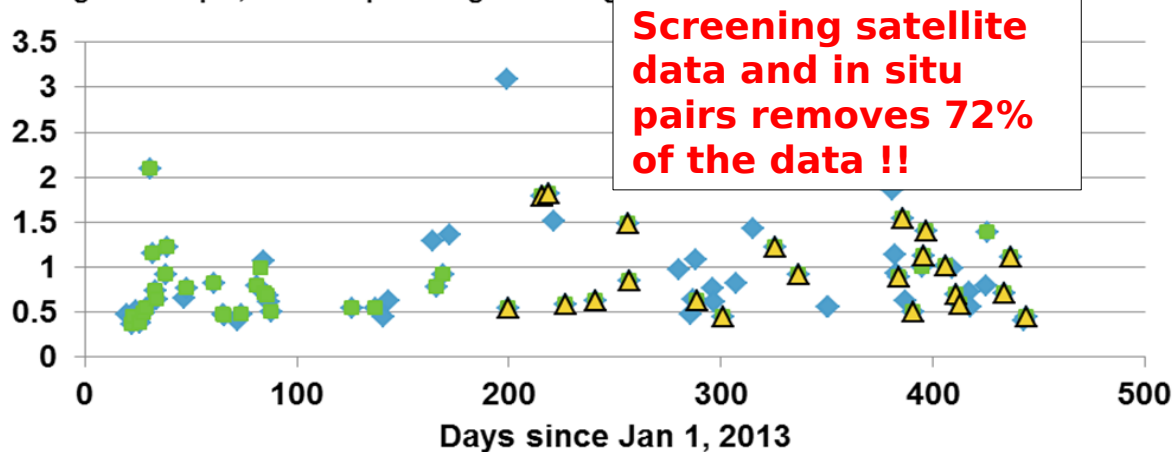
1. Accumulate coincident matchups (± 3 hrs) of satellite and in situ data (blue markers).

2. Apply screening criteria to coincident collections (green and yellow markers).

WCIS satellite retrieved nLw (551 nm)

Jan 1, 2013 to March 20, 2014

◆ original sample, n = 82 ■ pass flag screening n = 50 ▲ pass exclusion criteria n = 23



SCREENING CRITERIA IS CRITICAL!

As mission average calibrations have been shown to reach stability after 20 – 40 high quality calibration samples^{4, 8} consideration is given to balance the strictness of removal criteria and preservation of sample size.

Vicarious calibration

MOBY (*January 2012 to April 2013*)

Satellite constraints: within 3 hours of over pass and **no** flags allowed on satellite imagery

Exclusion criteria: wind speed must be less than 8 m/s, the maximum aerosol optical thickness (AOT) must be less than 0.2 as measured by the MOBY buoy, the nLw values must be between 0.001 and 3.0, the maximum solar zenith angle = 70 degrees and maximum sensor zenith angle = 56 degrees.

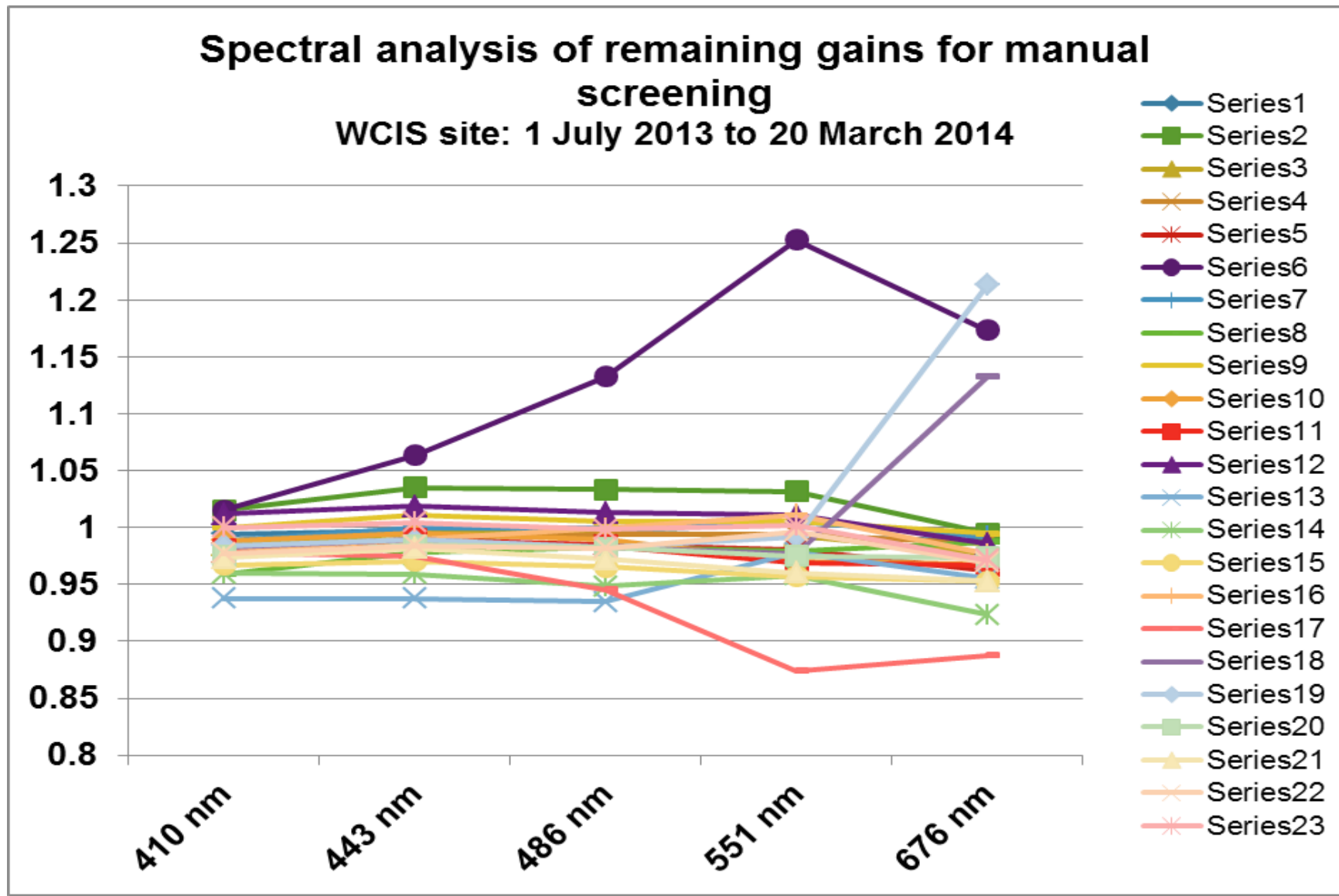
Regional VGA (*relaxed constraints*)

WaveCIS AERONET-OC (*Jan 2013 to Mar 2014*)

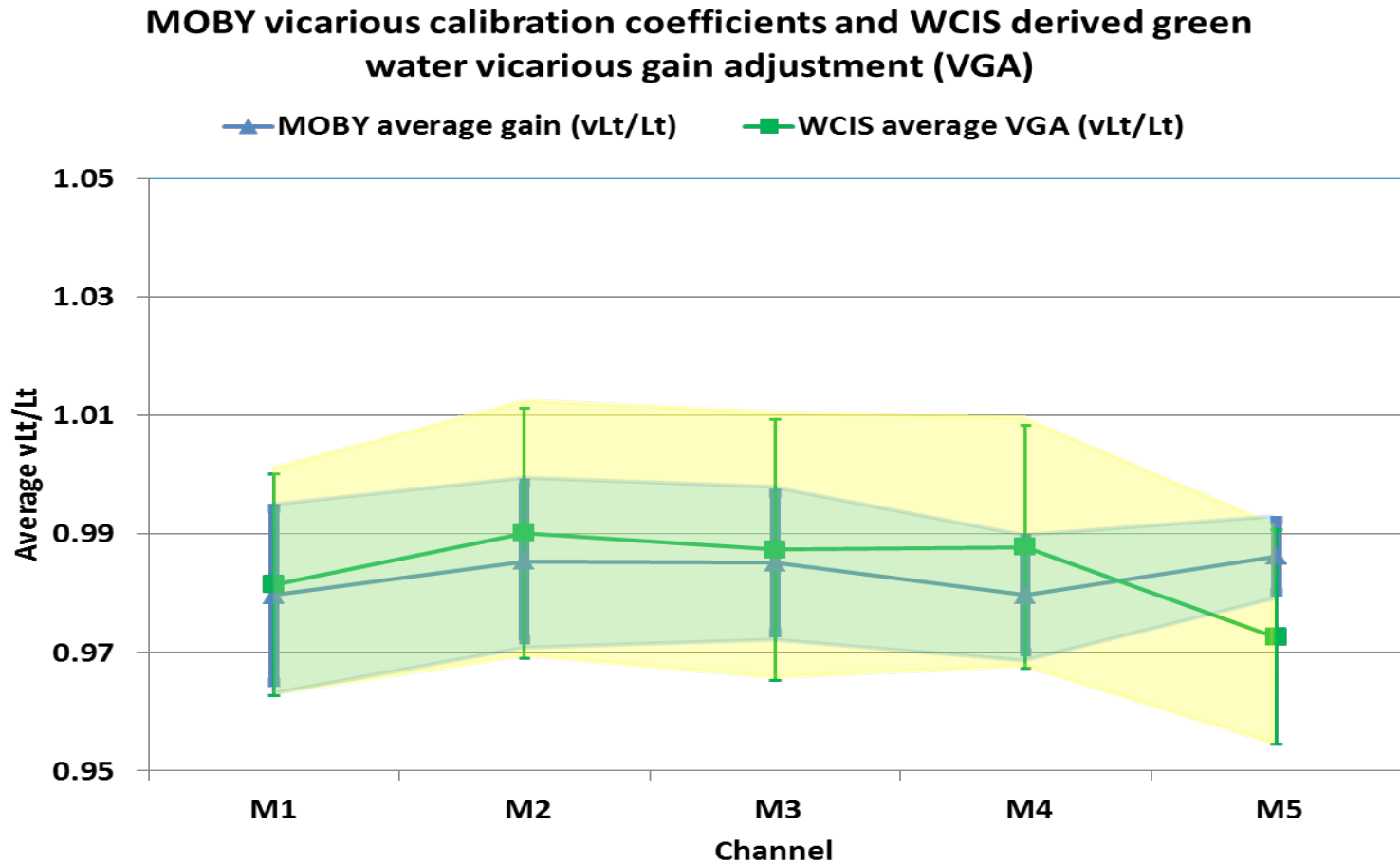
Satellite flags: within 3 hours of overpass, atmospheric failure, failure, cloud/ice, high LT, seaice, high satellite zenith angle, high solar zenith angle, epsilon out of range, high glint, max AER iteration, high polarization, moderate sun glint, and coccolithophores

Exclusion criteria: wind speed must be less than 8 m/s, the maximum aerosol optical thickness (AOT) must be less than 0.2 as measured by the AERONET, the nLw values must be between 0.001 and 3.0, the maximum solar zenith angle = 70 degrees and

3. Plot spectral gains and remove anomalies.



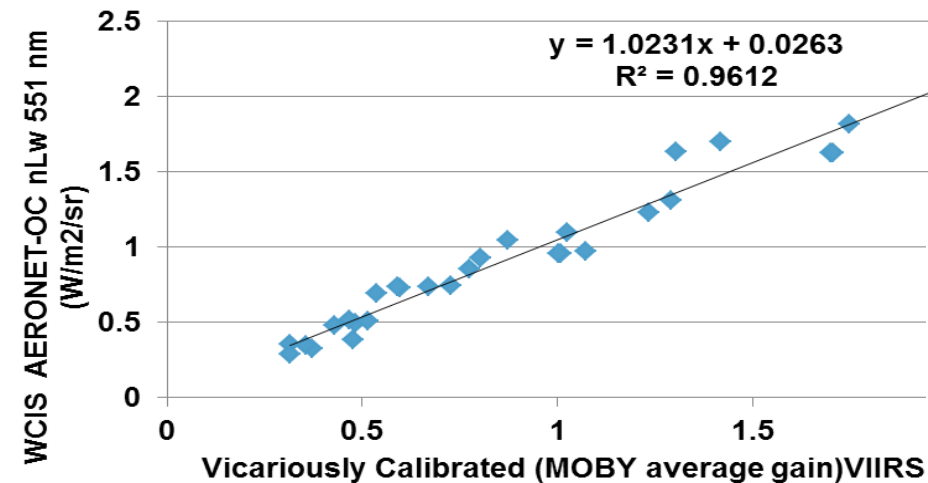
5. Calculate an average gain for each site:
MOBY vicarious calibration and
WCIS VGA.



6. Apply Vicarious calibration and VGA using APS and look at effects on the nLw retrievals

Vicarious calibration effect on WCIS nLw 551 nm matchups

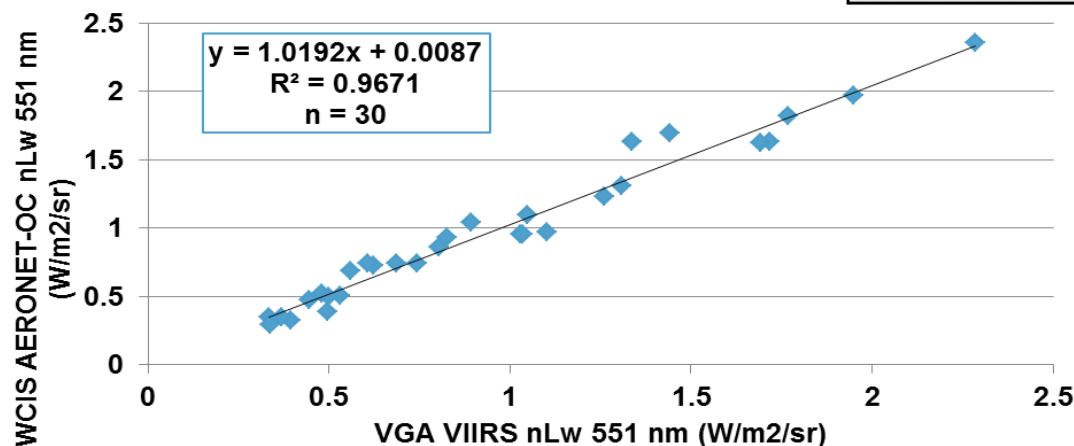
July 1, 2013 to March 20, 2014



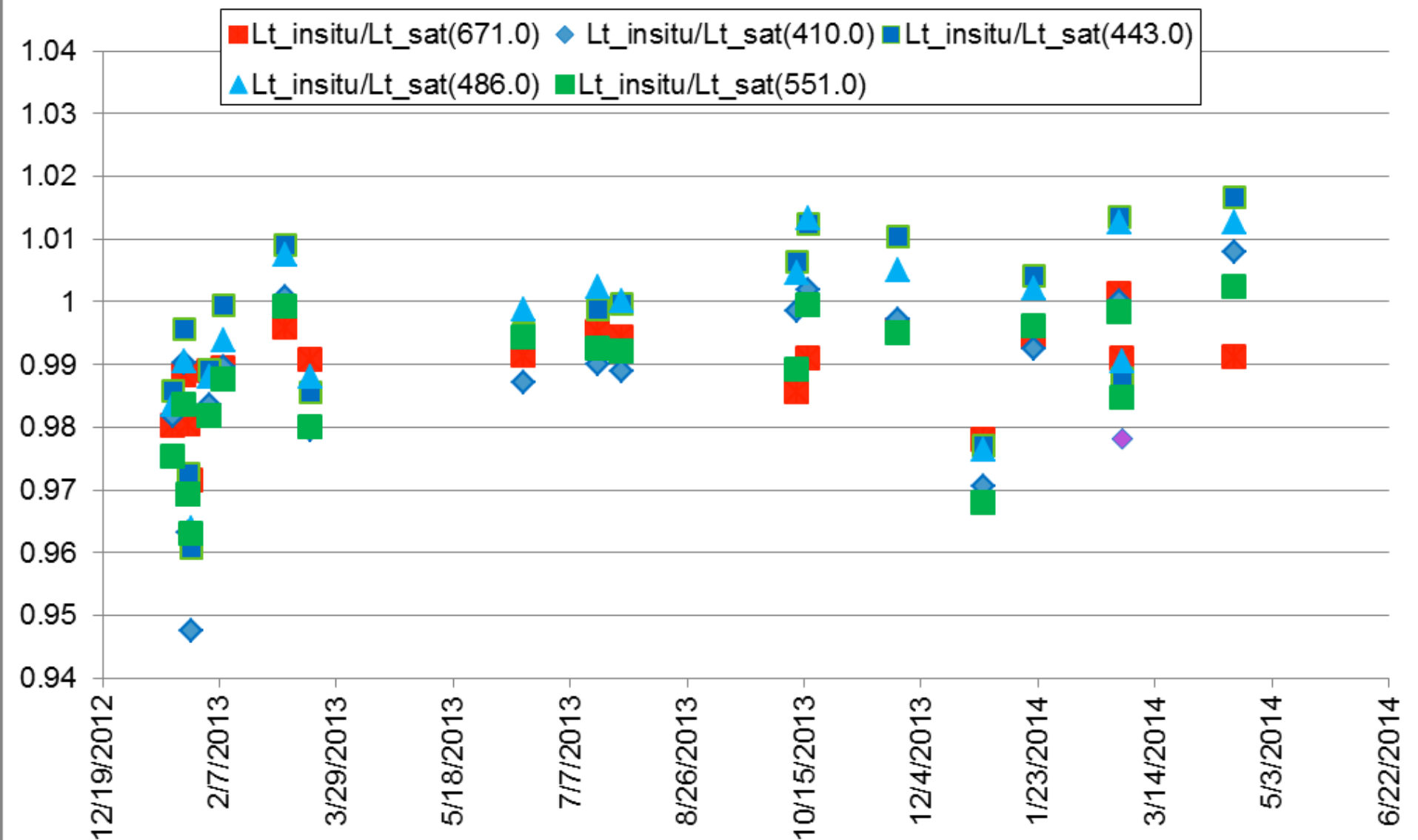
gain set	wavelength	regression equation	R ²
MOBY gains	nLw 410 nm	$y = 0.6151x + 0.1962$	$R^2 = 0.4005$
WCIS gains	nLw 410 nm	$y = 0.6894x + 0.1915$	$R^2 = 0.4213$
MOBY gains	nLw 443 nm	$y = 0.8955x + 0.1248$	$R^2 = 0.7199$
WCIS gains	nLw 443 nm	$y = 0.96x + 0.0819$	$R^2 = 0.7745$
MOBY gains	nLw 486 nm	$y = 1.083x + 0.025$	$R^2 = 0.9096$
WCIS gains	nLw 486 nm	$y = 1.105x + 0.0215$	$R^2 = 0.9317$
MOBY gains	nLw 551 nm	$y = 1.0231x + 0.0263$	$R^2 = 0.9612$
WCIS gains	nLw 551 nm	$y = 1.0192x + 0.0087$	$R^2 = 0.9671$
MOBY gains	nLw 671 nm	$y = 0.8689x + 0.0141$	$R^2 = 0.9337$
WCIS gains	nLw 671 nm	$y = 0.8853x + 0.0389$	$R^2 = 0.9433$

Green Water VGA effect on WCIS nLw 551 nm matchups

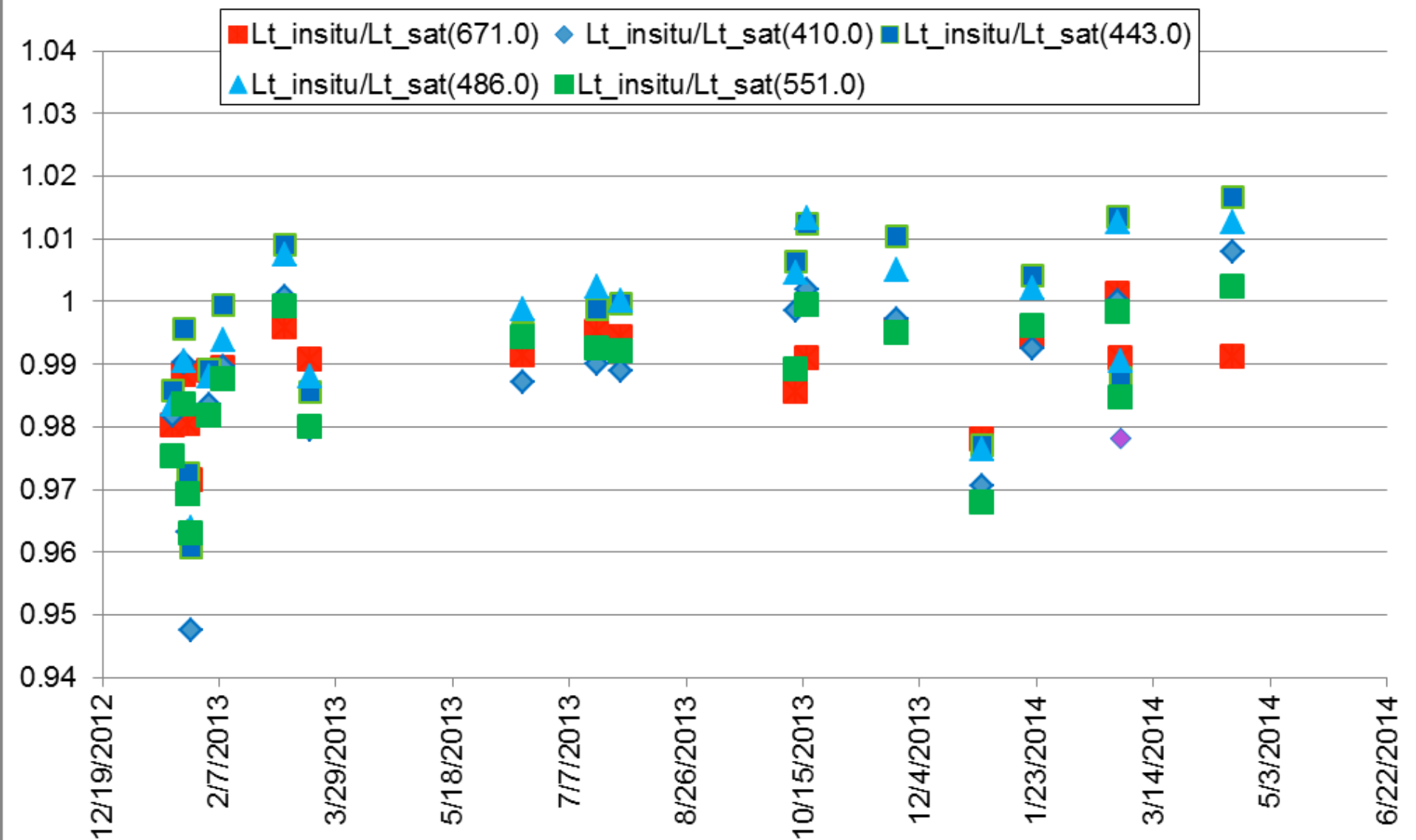
July 1, 2013 to March 20, 2014



ViCal Gain time series MOBY 2013 to April 2014



ViCal Gain time series MOBY 2013 to April 2014



GAINS from MOBY and WavCIS Sites

BLUE Water

MOBY - Marine Optical Buoy - Hawaii -
HAWAII - Homogenous water - Standard for Blue water
Gains from 25 Matchups points in - 2013

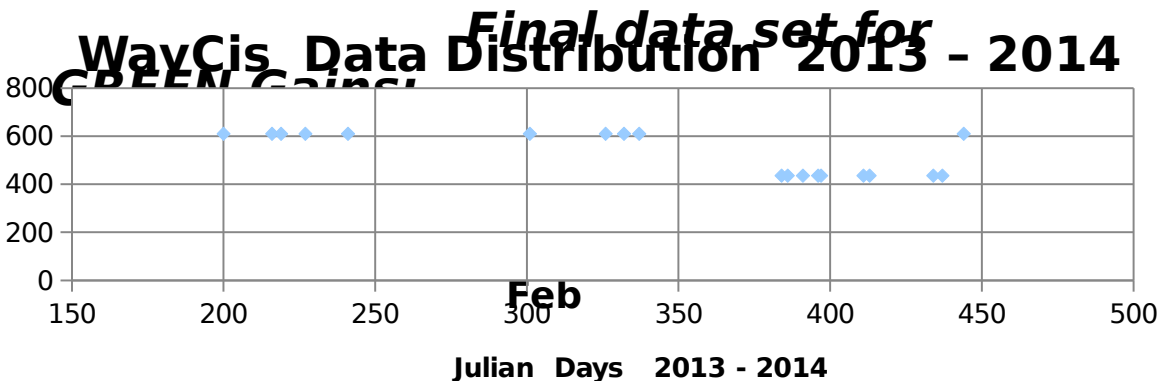
GREEN Water

WAVCIS - AERONET - SeaPRISM - Gulf of Mexico

Gains from 21 points

Screening and constraints of the data
outlined in:

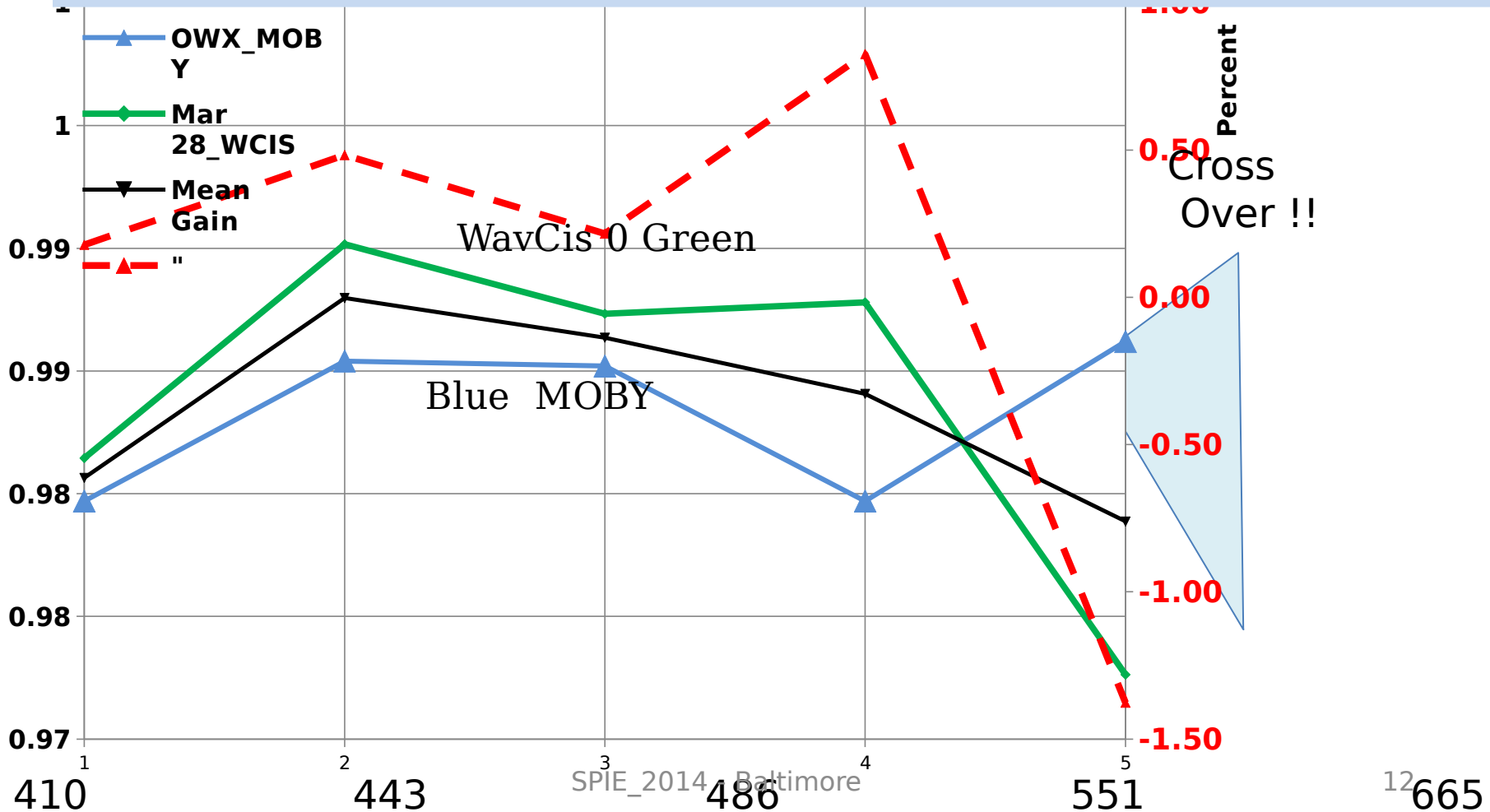
Bowers et al Poster 9111-41



Blue and Green Water Vicarious Gains July 2013 - March 2014

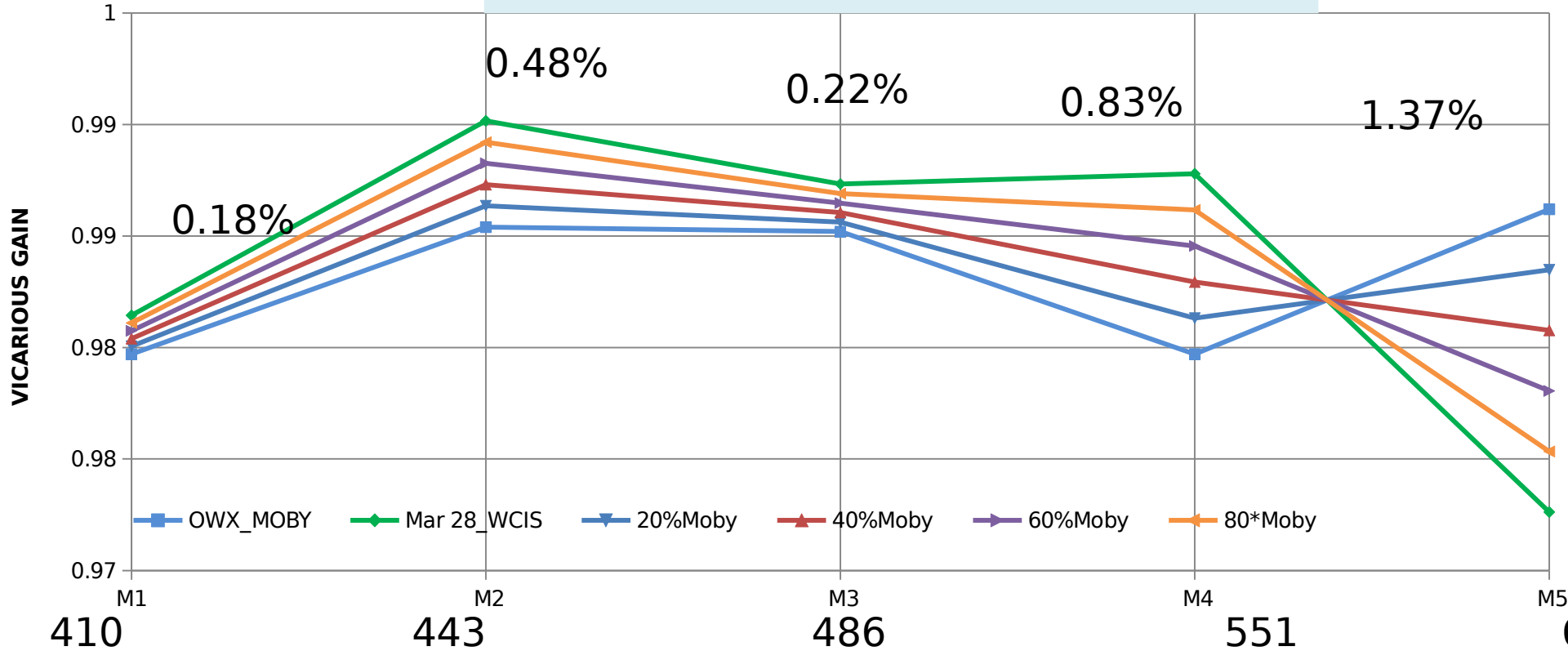
$$PD = 100 * \frac{GG - BG}{BG}$$

VICARIOUS GAIN



Linear Extrapolation from Blue to Green Green

Blue and Green Water Vicarious Gains Interpolation Blue to Green



How do these variations in the Gains Impact the Ocean color Products ?

- Chlorophyll = $m1/m3$ $m2/m3$
- Absorption and Backscattering

6 Ensembles GAINS

1 2 3 4 5

6

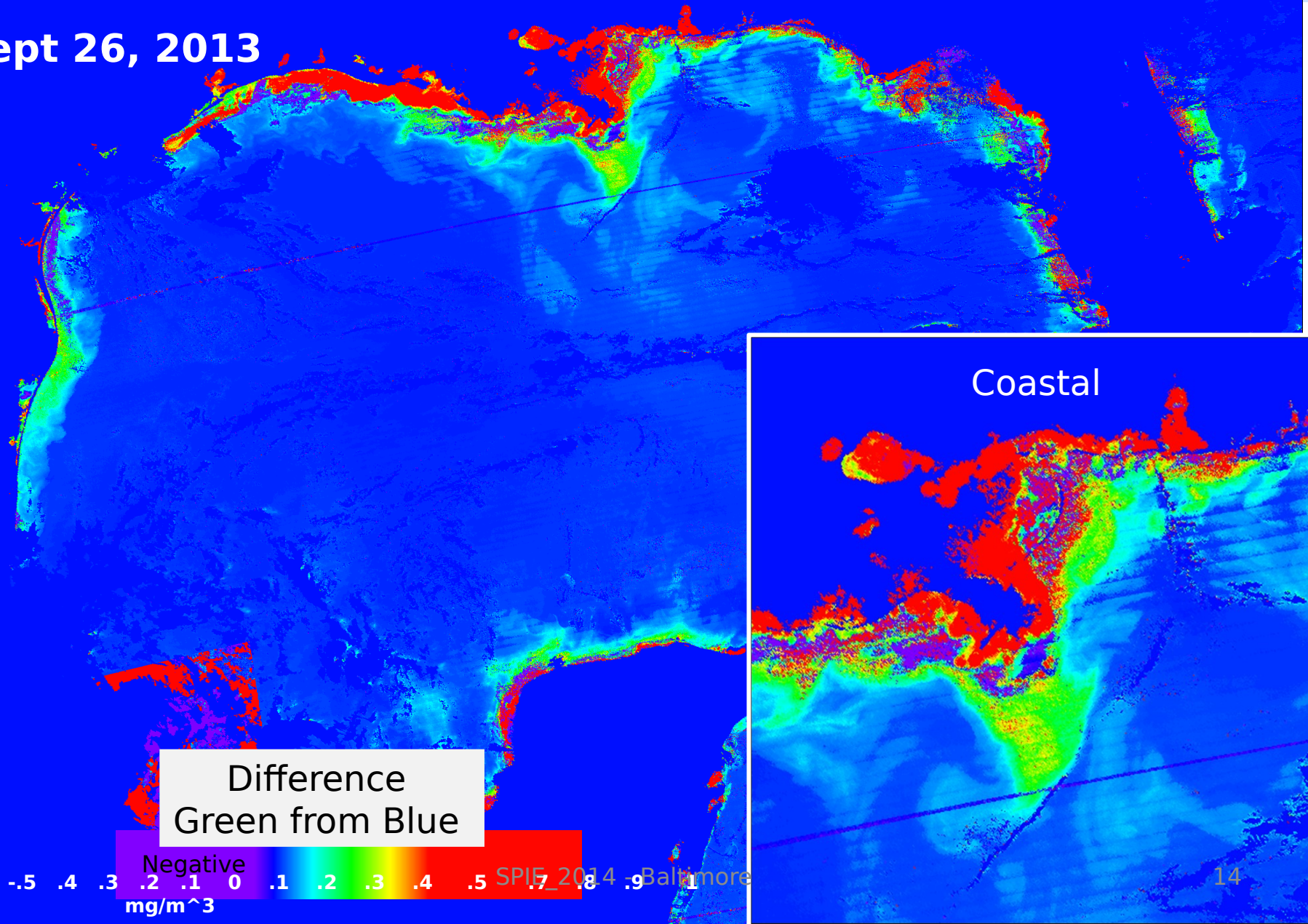
BLUE , 20, 40, 60 , 80, 100% Green

an color products

SPIE 2014 - Baltimore

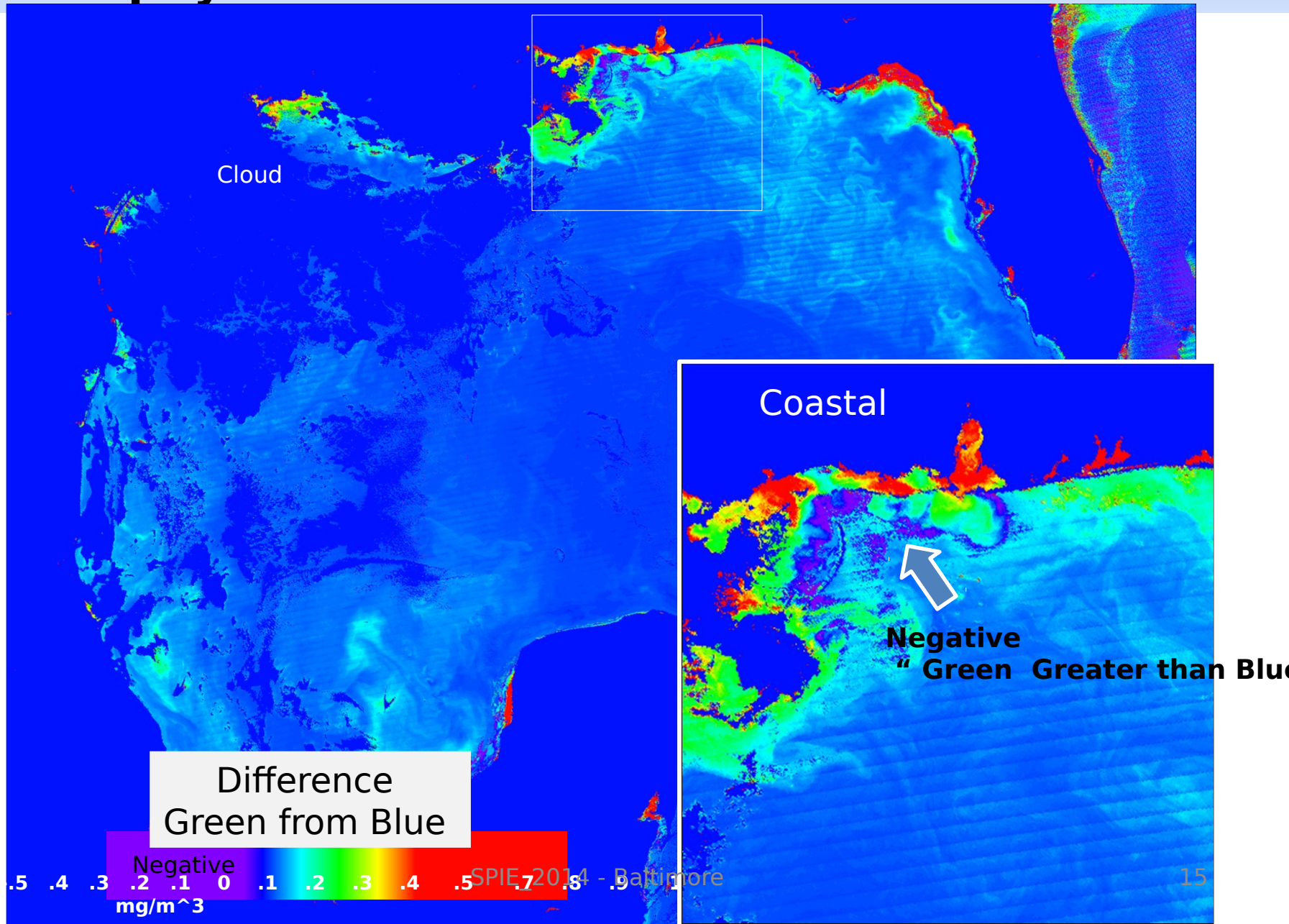
Chlorophyll Difference resulting from Green verse Blue Gains

Sept 26, 2013



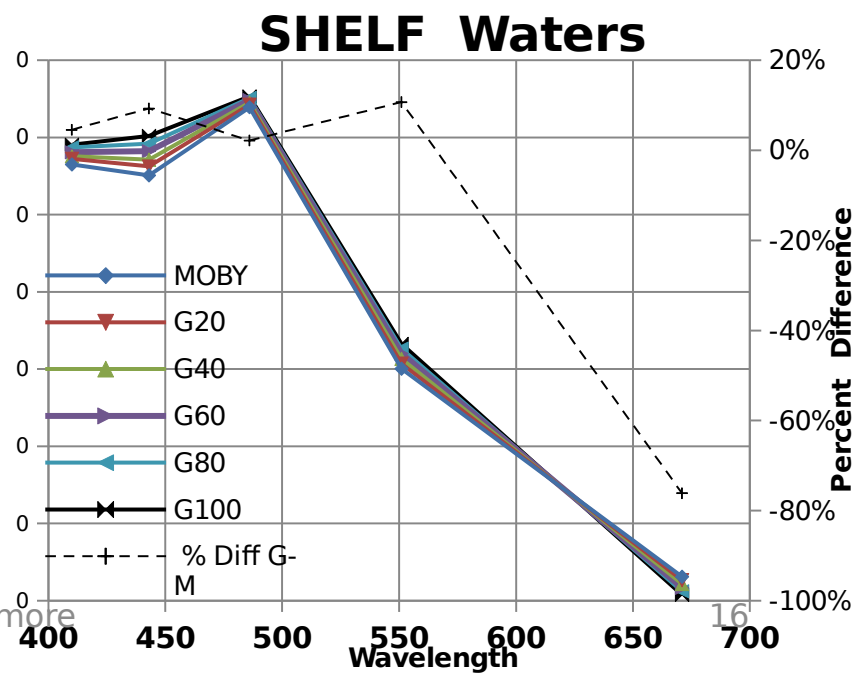
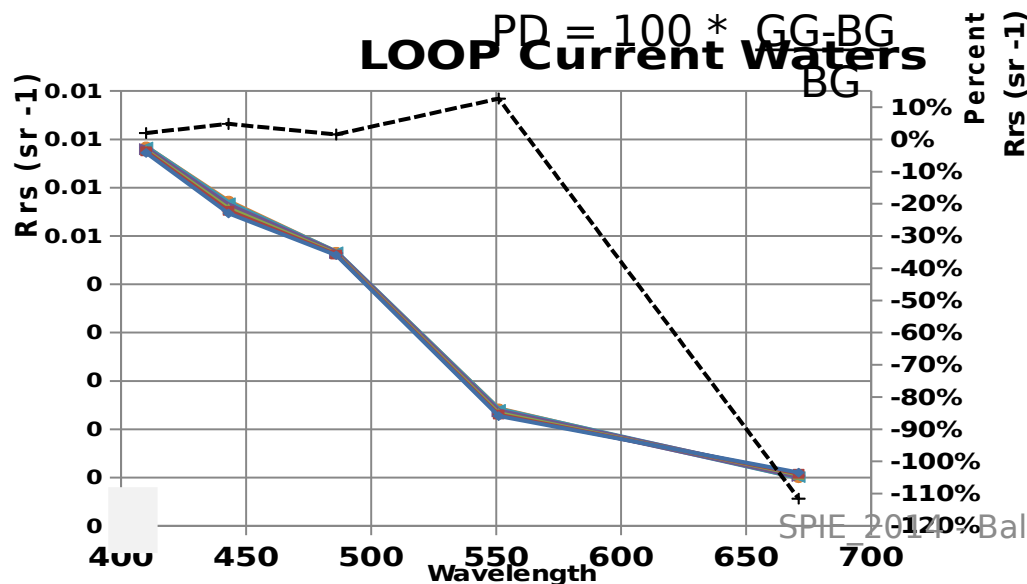
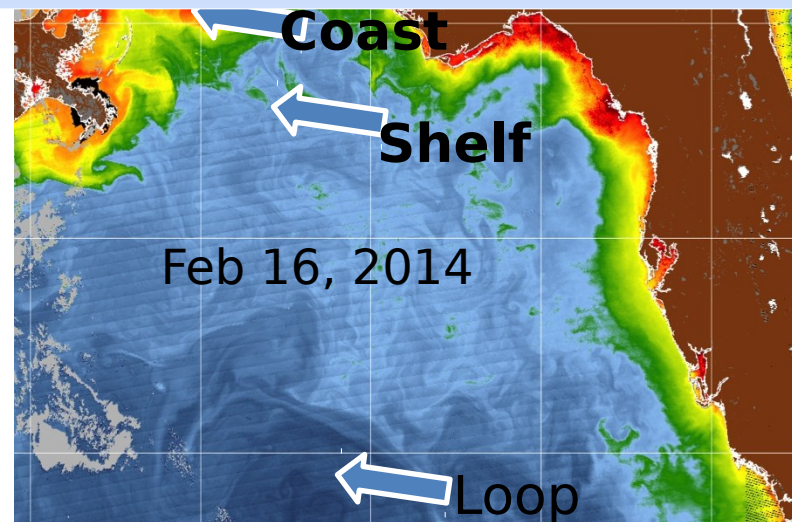
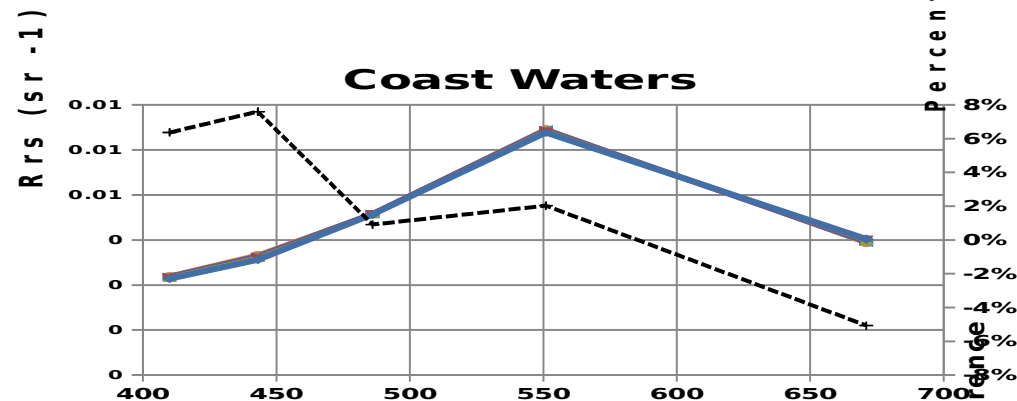
Feb 16, 2013

Chlorophyll Difference in Green verse Blue Gains



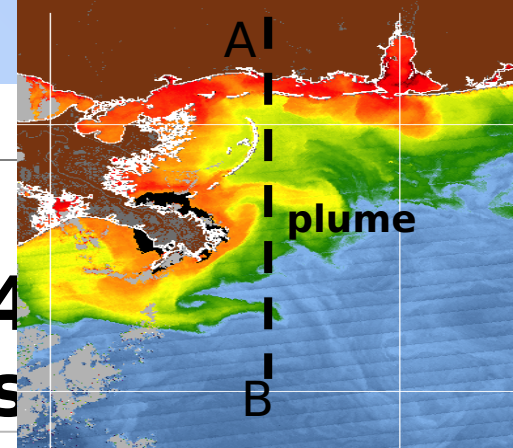
Spectral Water Mass Changes - MOBY and WavCi

Gains

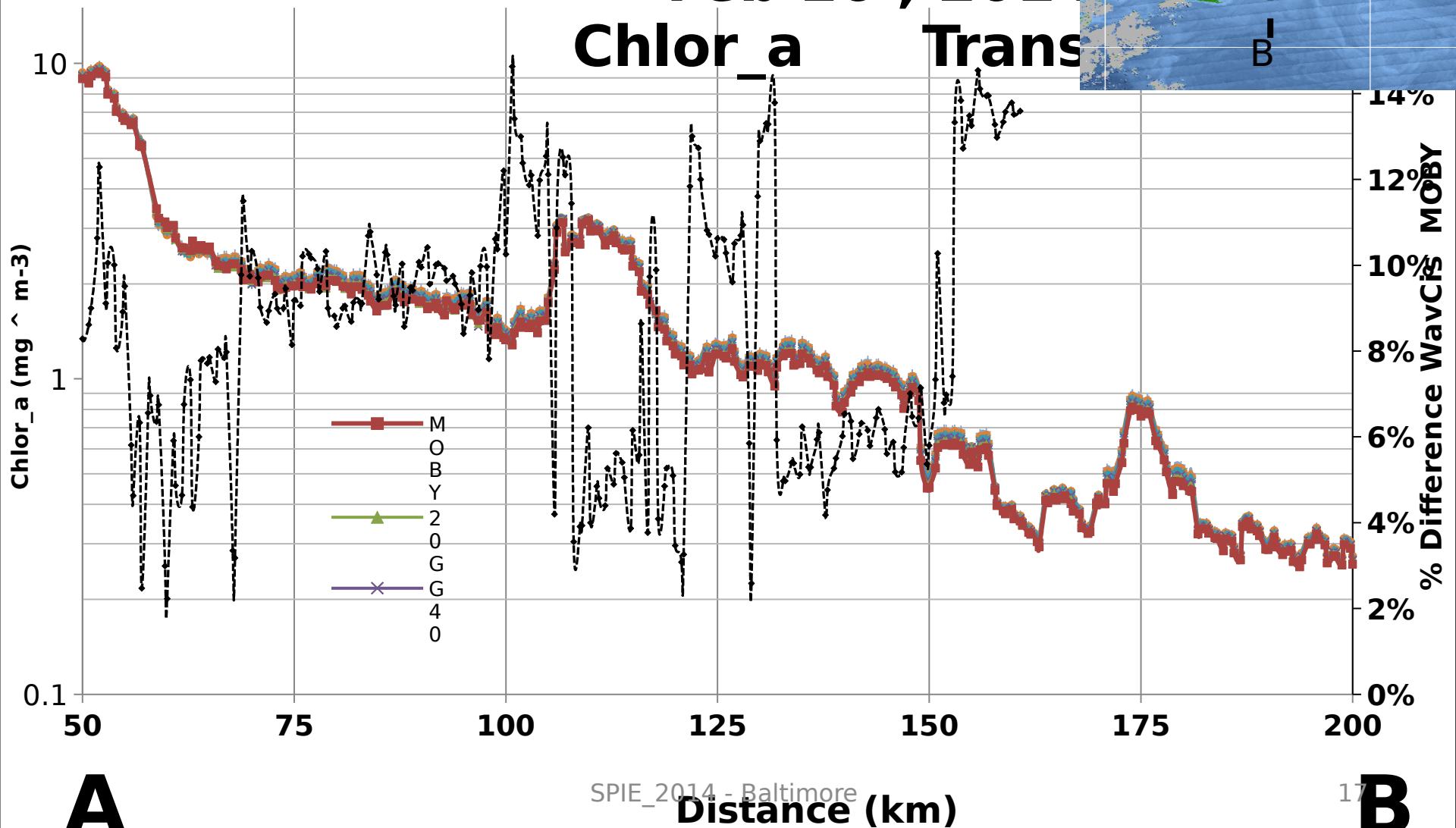


SPIE 2014 Baltimore

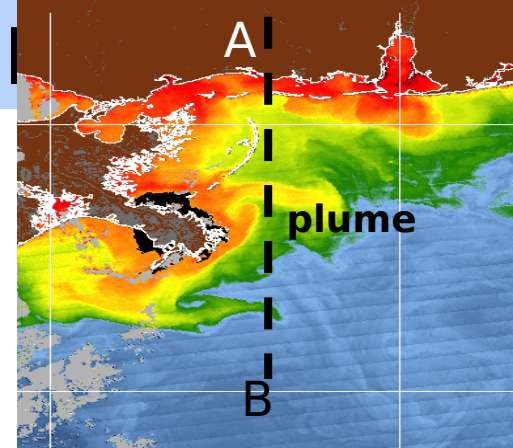
Gain Impacts along Profile



Feb 16, 2014
Chlor_a Trans

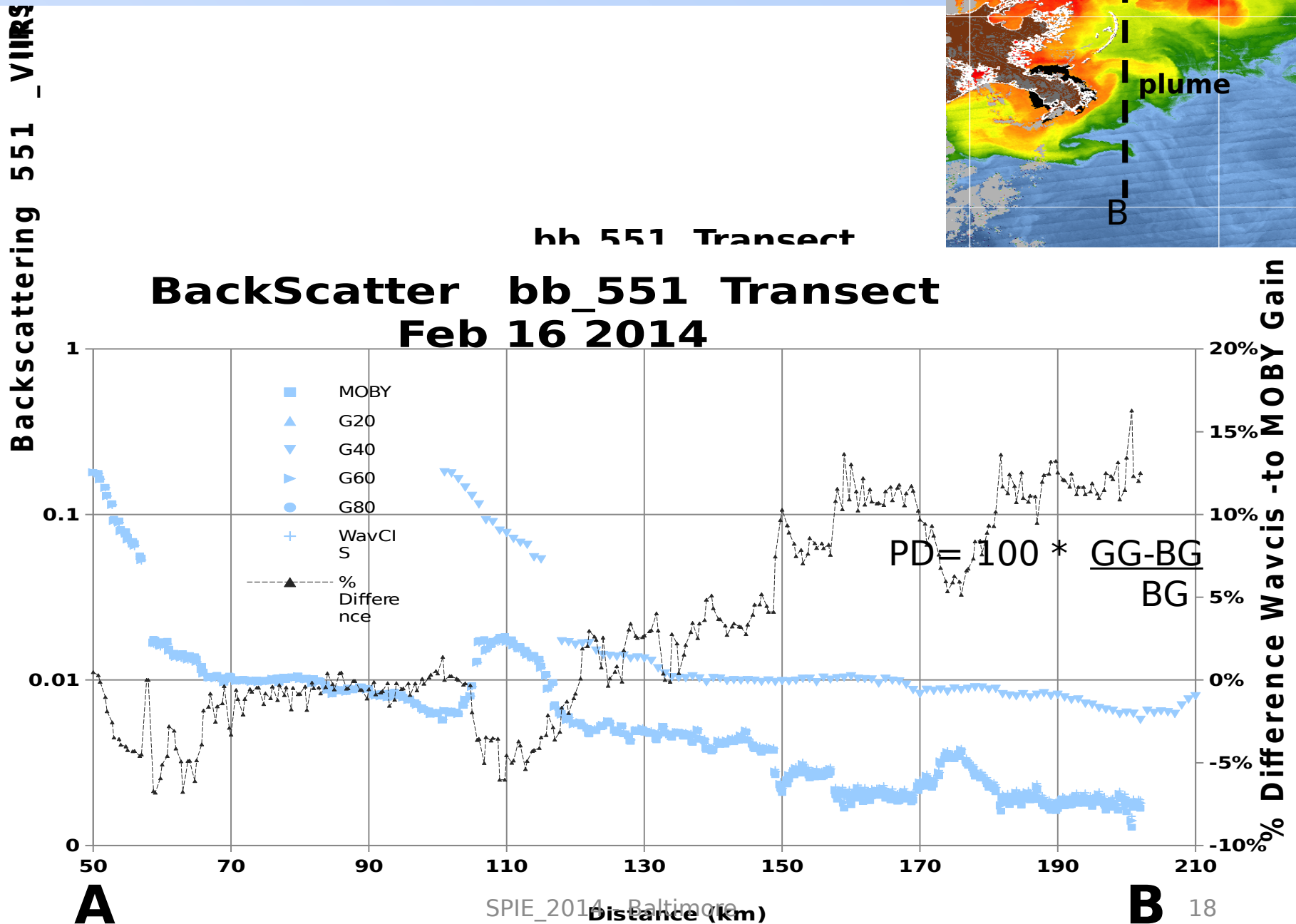


Gain Impacts along Profile

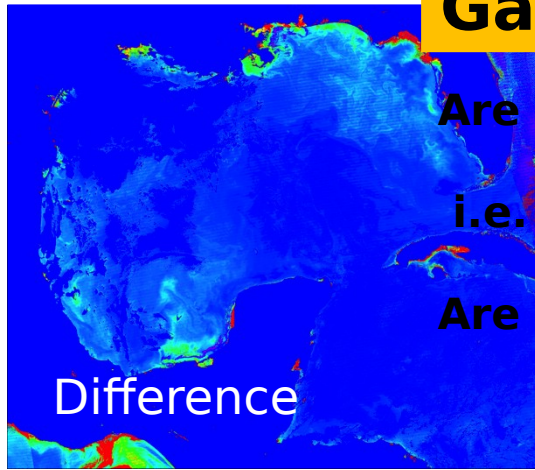


hh 551 Transect

Backscatter bb_551 Transect Feb 16 2014

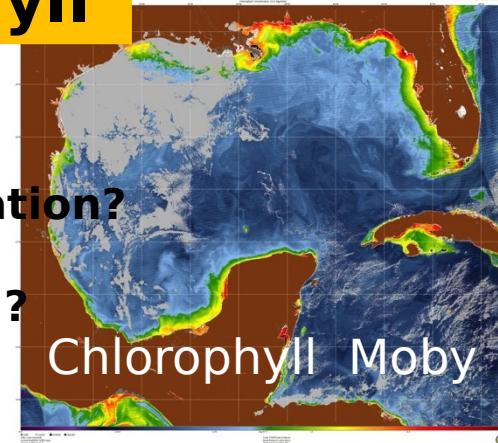


Gain Impacts on Chlorophyll



Are the Differences from the GAINS related to Concentration?
i.e. gains affect higher CHL concentration?

Are Difference regionally dependent?

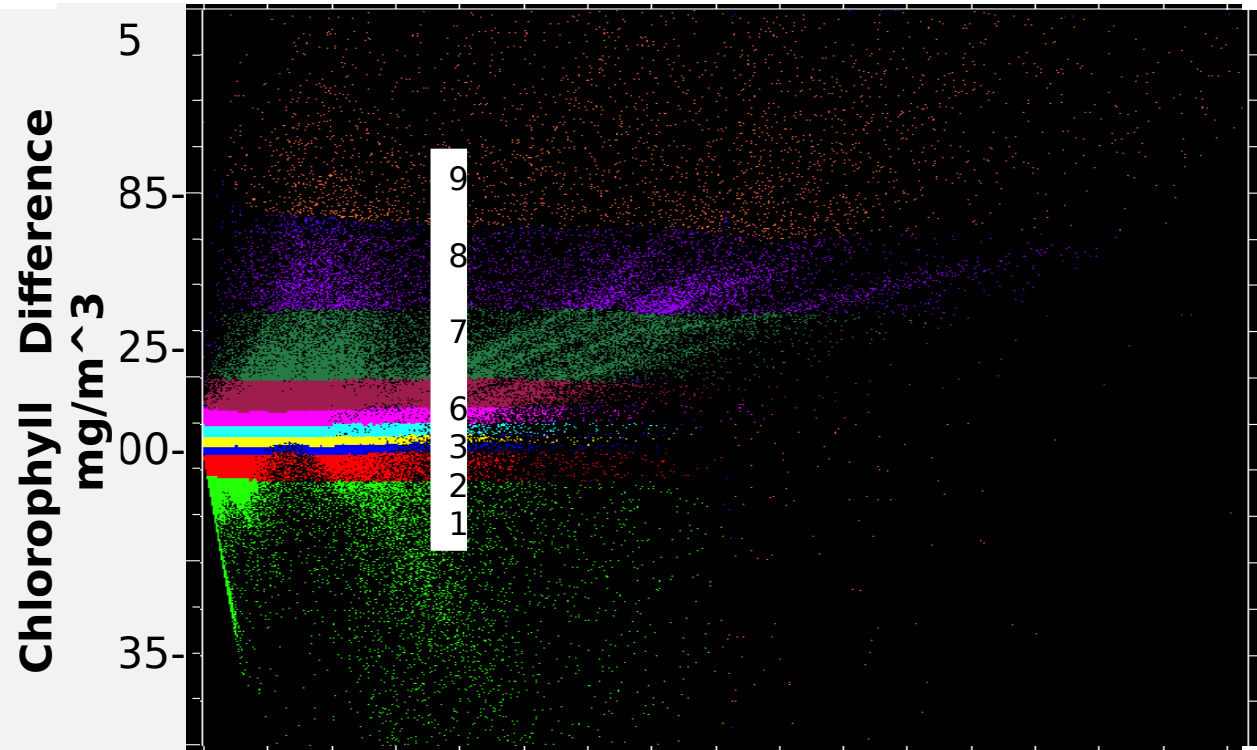


Scatterplot
Probability Density

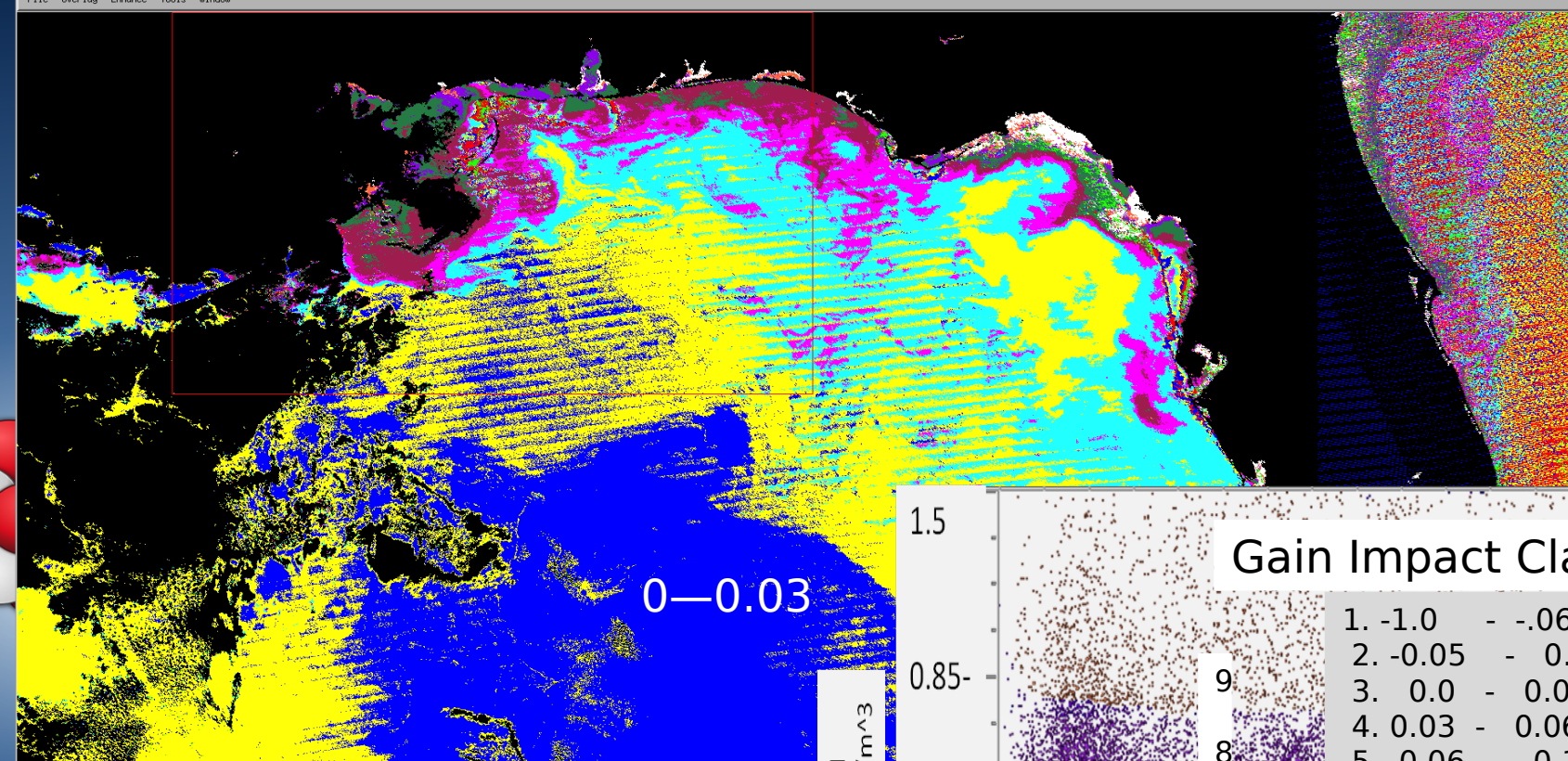
Difference =
Green - MOBY

Gain Impact
Classification

-1.0	-	-0.06	=	Green
-0.05	-	0.0	=	Red
0.0	-	0.03	=	Blue
0.03	-	0.06	=	Yellow
0.06	-	0.1	=	Lt Blue
0.1	-	0.15	=	Magenta
0.15	-	0.25	=	Maroone
0.25	-	0.5	=	Purple
0.75	-	1.5	=	Coral



OT Concentration related? SPIE 2014 Baltimore

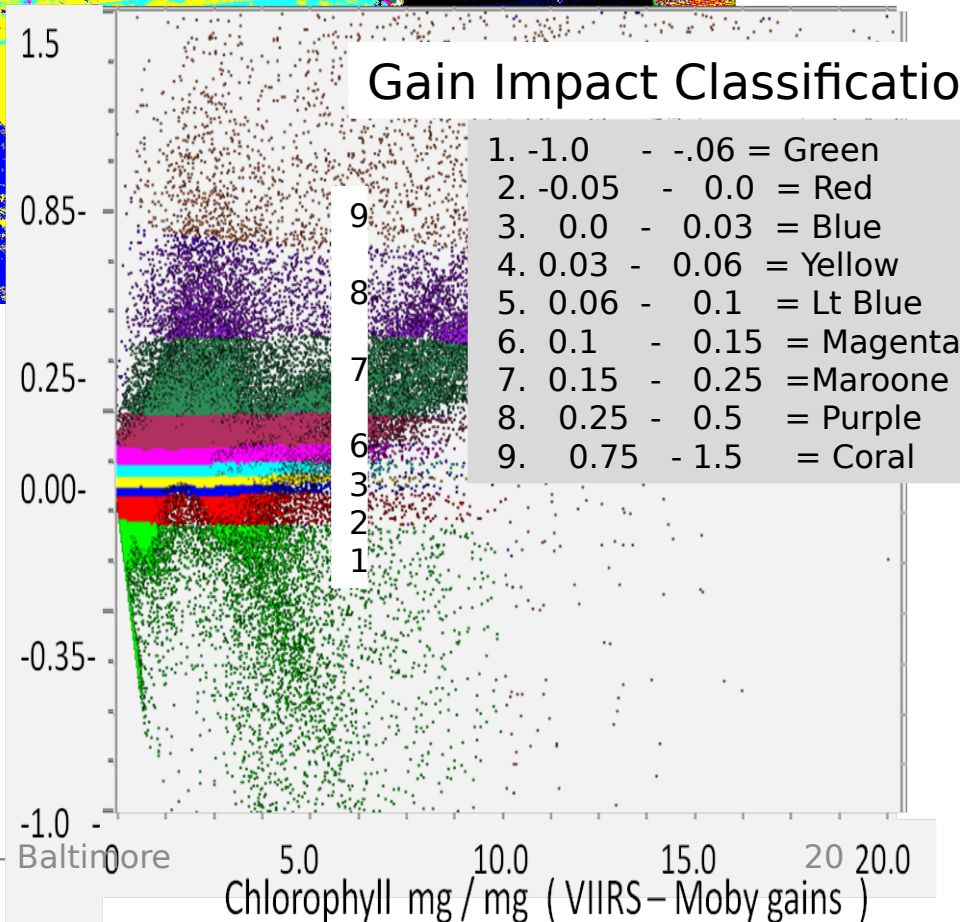


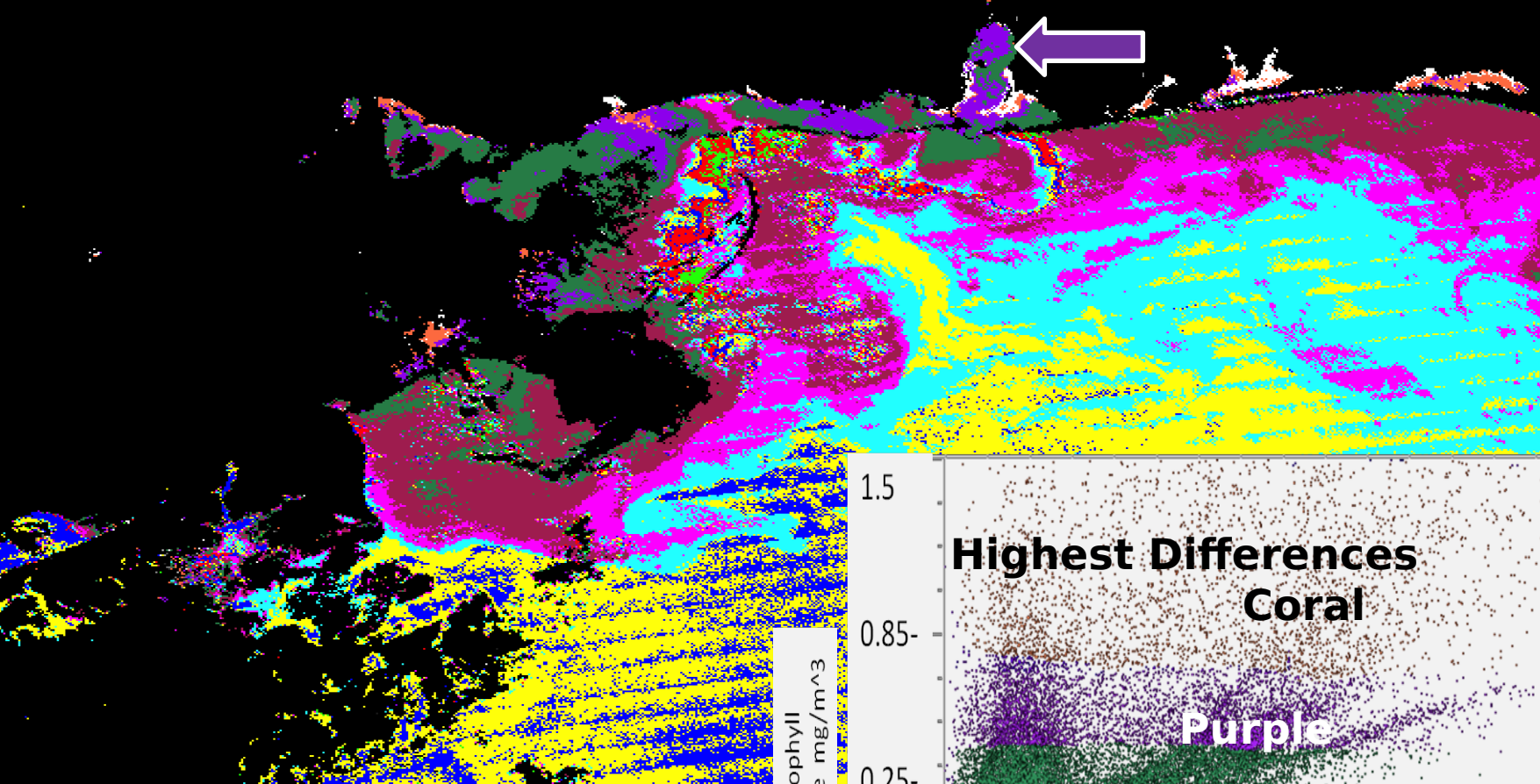
ation of where the Chlorophyll
ifferences occur?

te the open Ocean Loop has
imal differences -Blue 0- 0.03 mg/mg

gest Differences in coastal areas .

SPIE_2014 - Baltimore

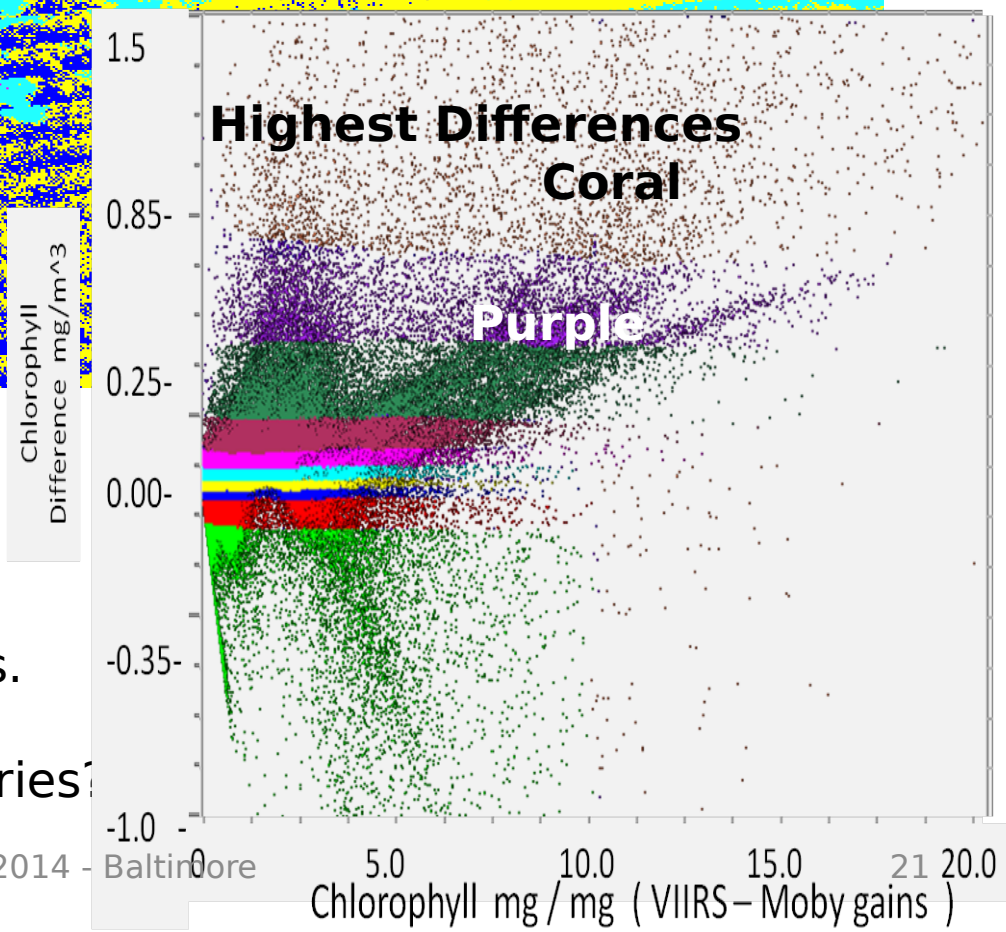




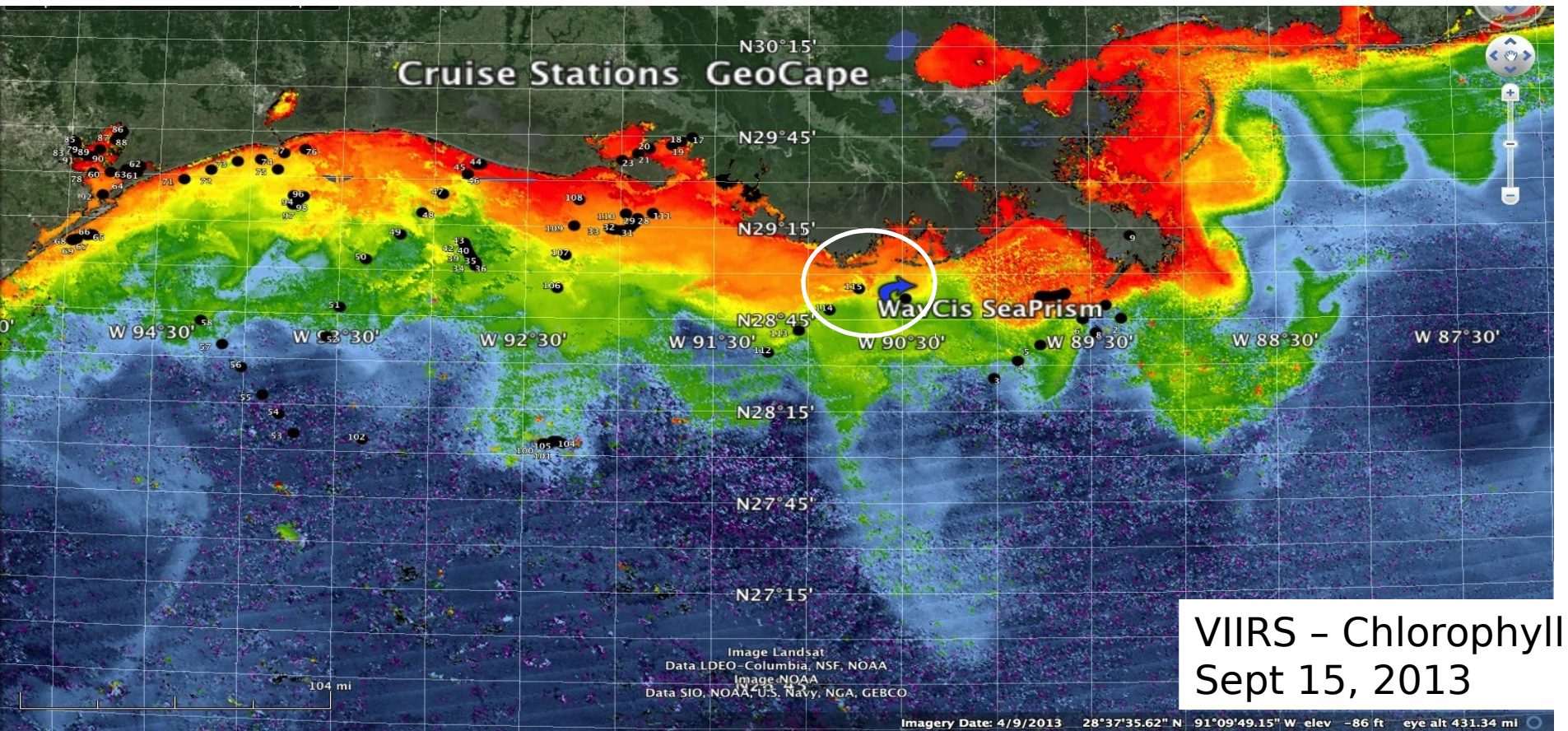
Location of where the Chlorophyll differences occur?

Largest Differences in Coastal waters.

Negative Difference at shelf boundaries?



Geo Cape comparisons of Blue and Green gains



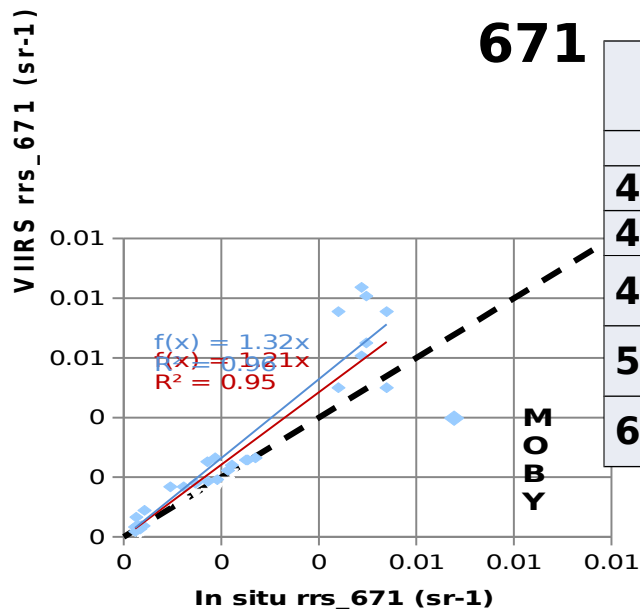
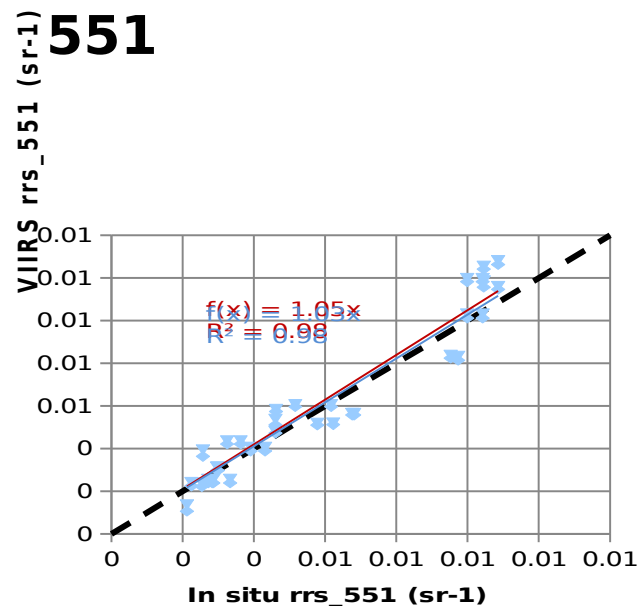
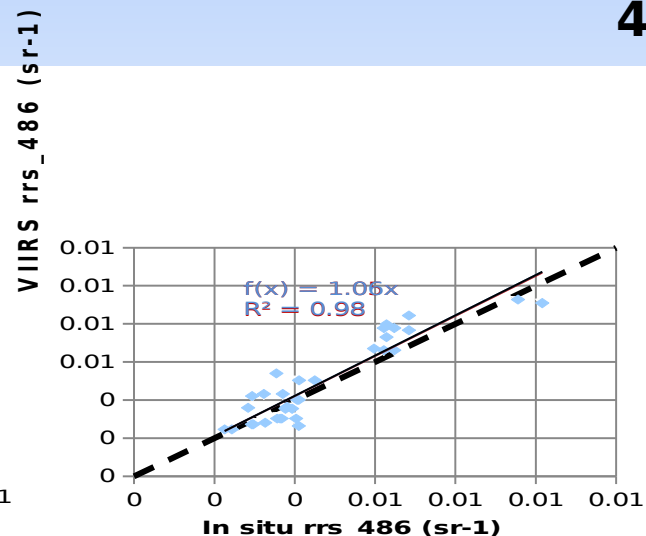
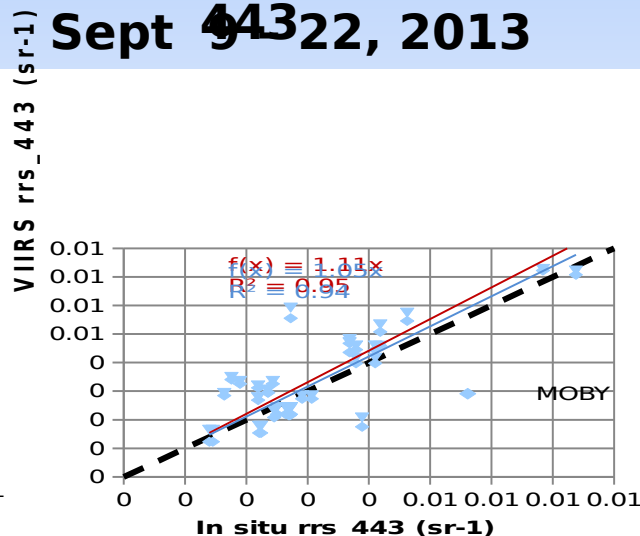
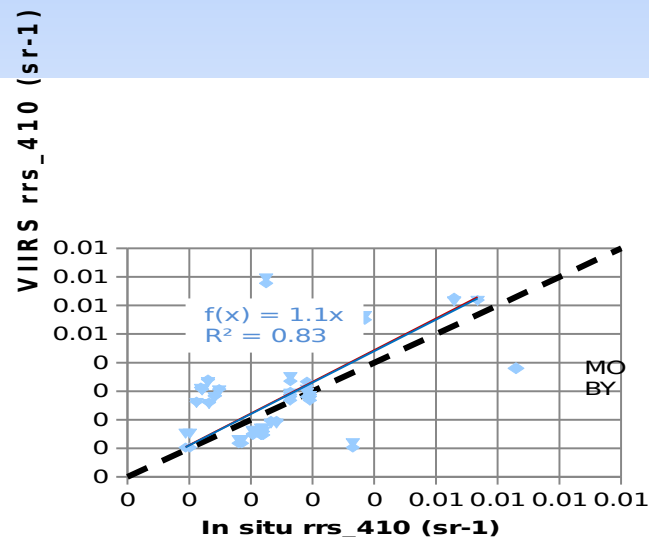
Location of the WavCis and the Green water Vicarious Gains

GeoCape Stations - 40 matchup

Comparison Gains with the RRS Matchup - 30 stations

Sept 9-22, 2013

4

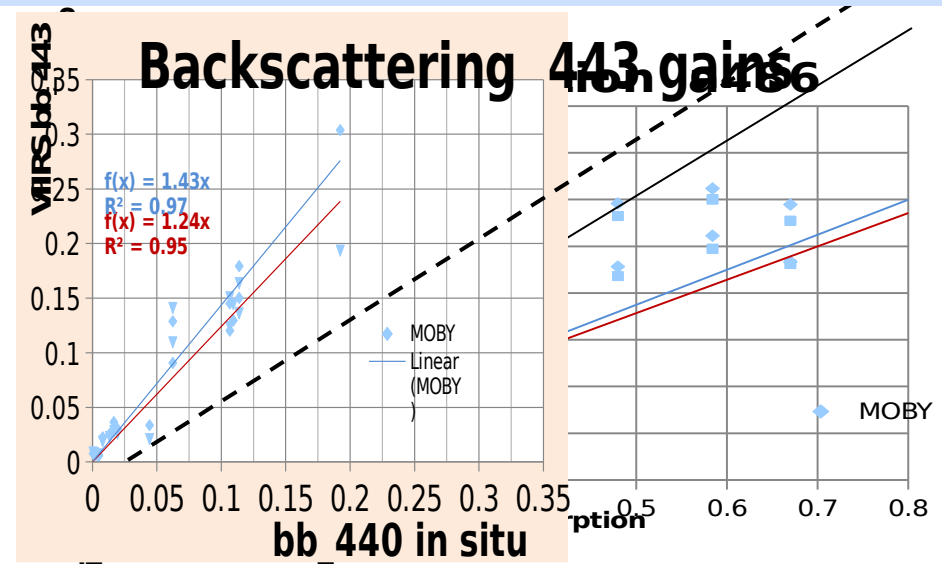
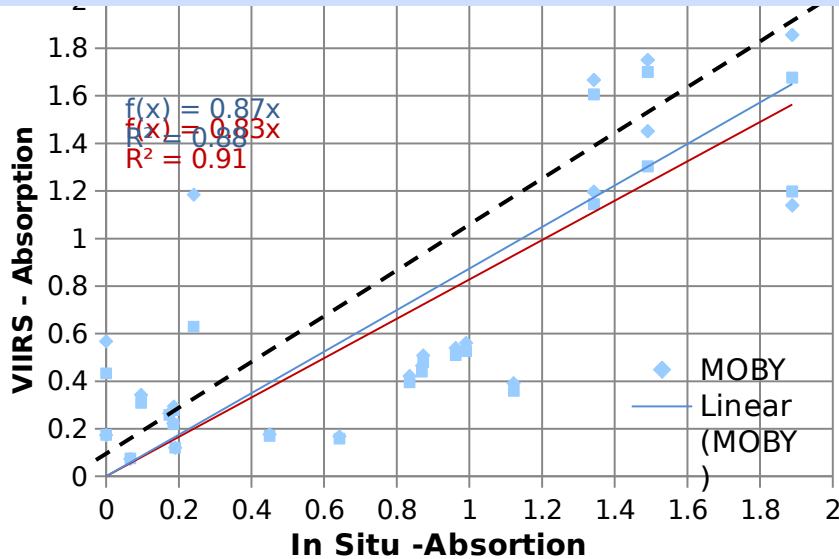


	Moby (Blue)		WavCis (Green)	
	R ²	Slope	R ²	Slope
410	0.2541	1.099	0.2231	1.107
443	0.6605	1.054	0.6477	1.106
486	0.8456	1.0558	0.8478	1.0298
551	0.9306	1.0275	0.9307	1.0495
671	0.9184	1.3207	0.915	1.2109

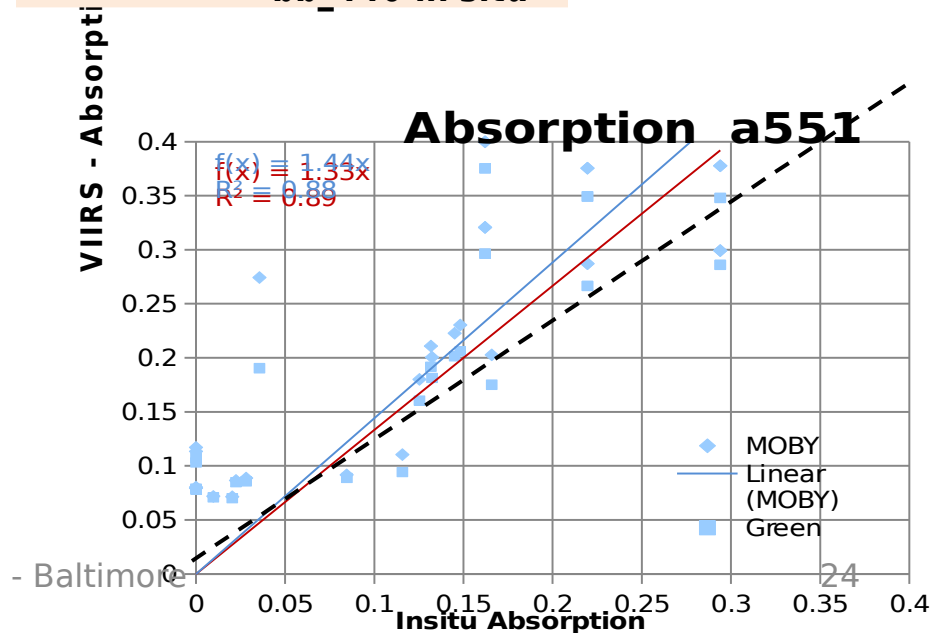
largest improvement in 671 nm with Slope - Not the regression

Impact of Gains on in situ IOP- derived Product

Coastal Waters GEOCAPE



L. Green Gain Closer to the One to One Line



Summary

- Impact of the gains derived from Open water (MOBY) and Coastal water (WavCis) was defined for ocean products.
- Vicarious adjustment determined using coastal and open waters for 2013

Using the MOBY and WavCIS AERONET Sites

- Spectral gain differences were small for the channels -
 - - largest in the 671 - (red)
- Impact of the differences of Chlorophyll was in coastal waters and little Impact on open waters.
- The differences not linked directly to the concentrations but to the water mass coastal waters .
- Small spectral adjustments has impact on the color products.
- Can open ocean water site only be used for vicarious calibration
- Adjustments in gain at a coastal site impacts the coastal products.
- Future efforts will determine if other coastal sites have similar affect on the gains?

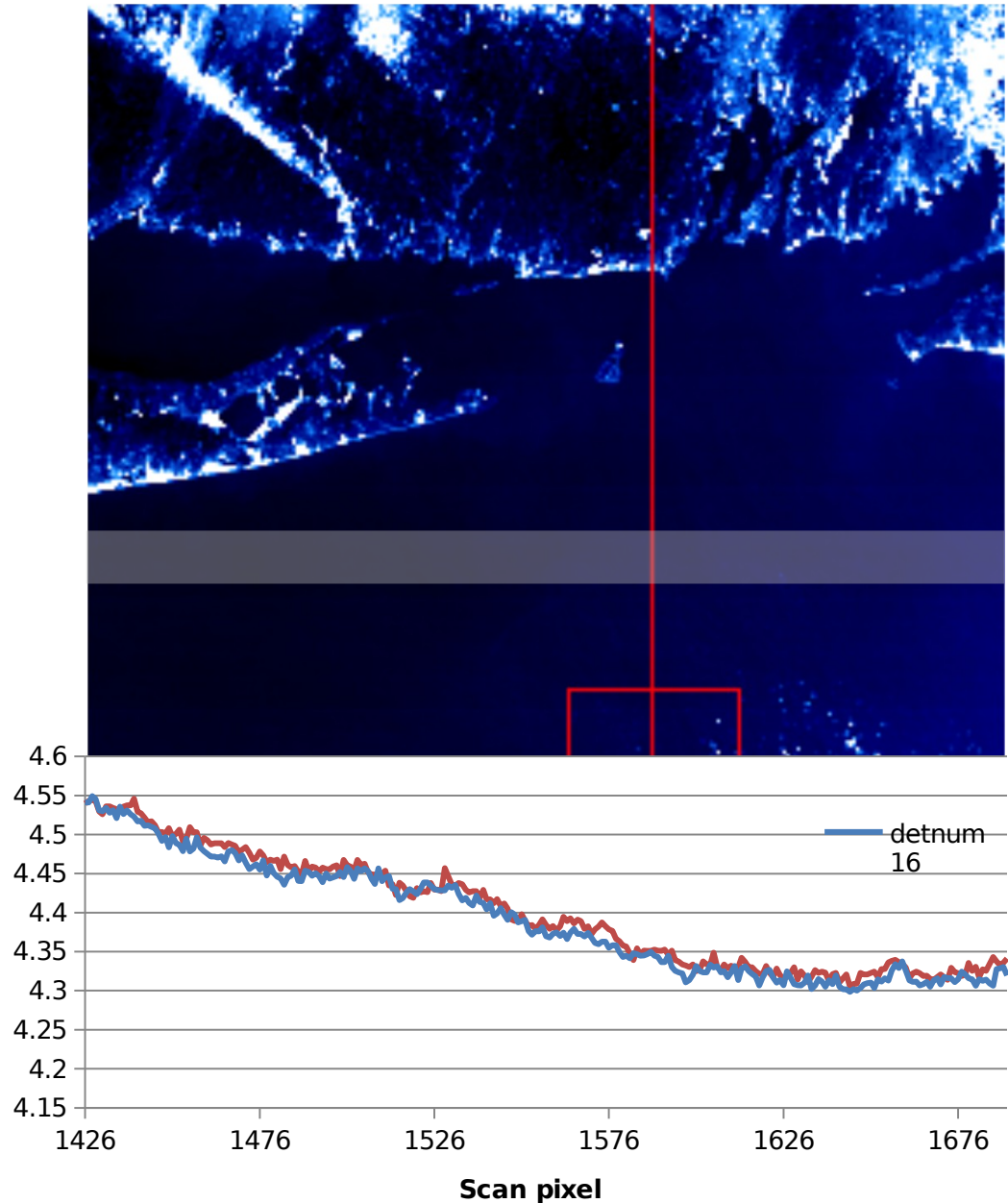
STIPPING

Near-nadir Horizontal profile

Lt_410

*Examining differences
2 detectors away
(1.5 km separation)*

*Across section, there
is an average 0.2 %
difference between
detector 16 and
detector 2 from next
scan*

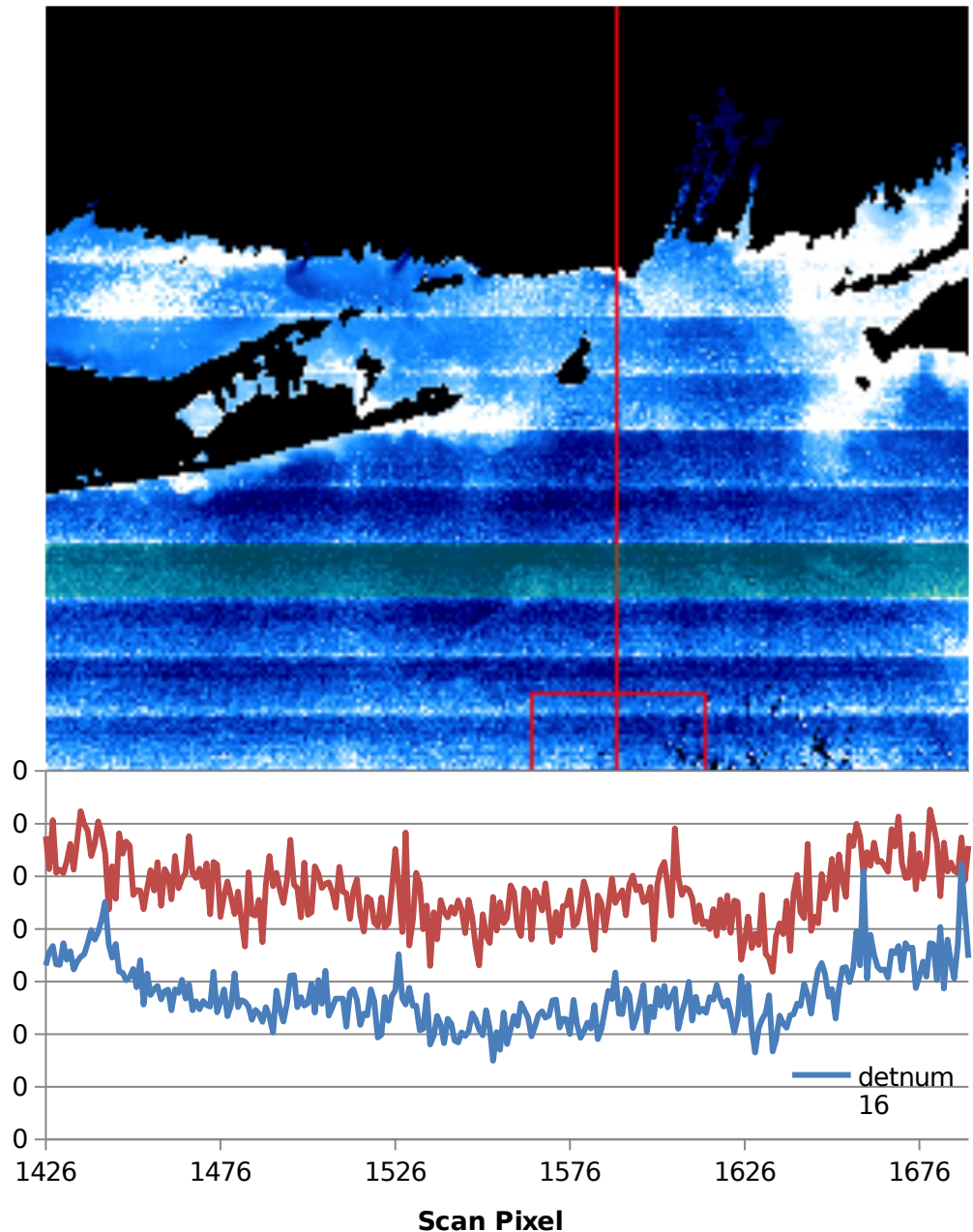


Near-nadir Horizontal profile

rrs_410

*Examining differences
2 detectors away
(1.5 km separation)*

*Across section, there
is an average 53 %
difference between
detector 16 and
detector 2 from next
scan*



Summary

- Next steps .

Cal - Val meeting update

June 5

Stennis team

Outline

- Constraints used in Matchups
 - MOBY , WavCIS
- Impact of Moby gains and Green gain on IDPS products
- VIIRS Striping issues
- Future Developments